Abhrajyoti Kundu
Computer Science & IT (CS)

BASIC LEVEL FULL SYLLABUS TEST -1 (GATE 2023) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(65) | CORRECT(44) | INCORRECT(14) | SKIPPED(7)

Q. 51 Have any Doubt ?

The maximum window size for data transmission using the selective repeat protocol with $2l$ – bit frame sequence numbers is

A $2^{l} - 1$

B $2^{2l} - 1$ — Your answer is **Correct**

Solution :
(b)
We know, $W_s + W_r \leq$ (Available sequence numbers)
or, $W_s + W_r \leq 2^{2l}$
Since, $W_s = W_r = x$ (say)
We have $2W \leq 2^{2l}$
For max window size $W = W_{max}$, we have $2W = 2^{2l}$ or $W = 2^{2l-1}$
Therefore option (b) is the answer.

C $2^{2l} - 1$

D $2^{2l} - 2$

QUESTION ANALYTICS +

Q. 52 Have any Doubt ?

Let $f(x, y) = xy + x'y'$. Then which of the following is correct?

A $f(x + y, y) = f(xy, y)$

B $f(xy, y) \cdot f(x + y, y) = f(x, y)$ — Your option is **Correct**

C $f(f(xy, y), f(x + y, y)) = f(x, y)$ — Your option is **Correct**

D $f(xy, y)$ is dual of $f(x + y, y)$

YOUR ANSWER - b,c | CORRECT ANSWER - b,c | STATUS - ✓

Solution :
(b, c)
Let check (a) first.
LHS: $f(x + y, y) = (x + y)y + (x + y)'y'$
$= xy + y + x'y' \equiv y + x'y'$
$= x' + y$ or $x \Rightarrow y$
RHS: $f(xy, y) = xy \cdot y + (xy)'y'$
$= xy + (x' + y')y'$
$= xy + x'y' + y'$
$= xy + y'$
$= (y' + x)$ or $y \Rightarrow x$
Clearly $(x \Rightarrow y) \neq (y \Rightarrow x)$ so (a) is false.
But (b) is true, as $f(x + y, y) \cdot f(xy, y)$
$\equiv (x \Rightarrow y) \wedge (y \Rightarrow x)$
$\equiv x \Leftrightarrow y$ or $x \varepsilon y$
$\Downarrow$
$f(x, y)$

Similarly, $f(f(x+y, y), f(xy, y))$

$\equiv f((x \Rightarrow y), f(y \Rightarrow x))$

$\equiv (x \Rightarrow y \wedge y \Rightarrow x) \vee ((x \Rightarrow y)' \wedge (y \Rightarrow x)')$

$\equiv (x \varepsilon y) \vee (xy' \wedge x'y) \rightarrow 0$

$\equiv x \varepsilon y \equiv f(x, y) \Rightarrow$ (c) is true

Option (d) is clearly false.
So option (b), (c) are correct.

QUESTION ANALYTICS +

Q. 53 Have any Doubt ?

The maximum number of IPv4 router addresses that can be listed in the record route (RR) option field of an IPv4 header is _____.

9 Your answer is Correct9

Solution :
9
9 is the max number of IPv4 router addresses that can be listed in record route field.

QUESTION ANALYTICS +

Q. 54 Have any Doubt ?

A certain processor uses a 4 way set associative cache of size 16 kB. The cache block size is 16 bytes. Assume that the main memory is byte addressable and uses a 32 bit address. How many bits are required for the tag and the Index fields respectively in the addresses generated by the processor?

A 18, 10

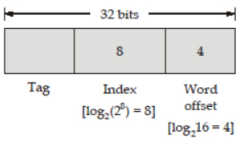
B 20, 8 Your answer is Correct

Solution :
(b)

4 way set associative cache size = 16 kB; Block size = 16 B

$\therefore$ Number of sets $= \dfrac{16\text{ KB}}{16\text{ B/line} \times 4\text{ lines/set}}$

$= \left(\dfrac{2^{14}}{2^4 \times 2^2}\right) = 2^8$ sets



(Number of tag bits required) = 32 – (8 + 4) = 20

C 18, 8

D 20, 10

QUESTION ANALYTICS +

Q. 55 Have any Doubt ?

Consider two DFAs $D_1(Q_1, \Sigma, \delta_1, q_{01}, F_1)$ and $D_2(Q_2, \Sigma, \delta_2, q_{02}, F_2)$. Let $L(D_1)$ and $L(D_2)$ be the languages accepted by DFAs D_1 and D_2. Consider the cross product DFA (also known as product automata) $D(Q_1, \Sigma, \delta_1, q_0, F)$ denoted as $D_1 \times D_2$, designed to accept the language $L(D_1) \oplus L(D_2)$.
Then which of the following is/are true about D?

A $Q = \{(q_1, q_2) \mid q_1 \in Q_1, q_2 \in Q_2\}$ Correct Option

B $F = \{(q_1, q_2) \mid q_1 \in F_1 \text{ and } q_2 \in F_2\}$

C $F = \{(q_1, q_2) \mid q_1 \in F_1 \text{ and } q_2 \in Q_2 - F_2\} \cup \{(q_1, q_2) \mid q_1 \in Q_1 - F_1 \text{ and } q_2 \in F_2\}$ Correct Option

D None of these

YOUR ANSWER - NA | CORRECT ANSWER - a,c | STATUS - SKIPPED

Solution :

(a, c)

Since $Q = Q_1 \times Q_2$, (a) is true.
Now a state (q_1, q_2) in the product automaton will be final if and only if exactly one of q_1 and q_2 is final. That is, either q_1 is final and q_2 is non final, or q_2 is final and q_1 is non final.
Therefore (c) is also true. However (b) is clearly false.
Hence the final answer is (a) and (c).

QUESTION ANALYTICS +

Q. 56 Have any Doubt ?

Consider the following functions $W(n)$, $X(n)$, $Y(n)$ and $Z(n)$ whose recurrence relations are given below:

$$W(n) = W\left(\frac{n}{2}\right) + 1$$

$$X(n) = X\left(\frac{n}{2}\right) + n$$

$$Y(n) = 2Y\left(\frac{n}{2}\right) + n$$

Which of the following is/are correct?

A $W(n) = O(\log n)$ — Your option is **Correct**

B $X(n) = O(n)$ — Your option is **Correct**

C $Y(n) = O(n \log n)$ — Your option is **Correct**

D None of these

YOUR ANSWER - a,b,c | CORRECT ANSWER - a,b,c | STATUS - ✓

Solution :

(a, b, c)

$$W(n) = O(\log n)$$
$$X(n) = O(n)$$
$$Y(n) = O(n \log n)$$

Therefore (a), (b), (c) are true.

QUESTION ANALYTICS +

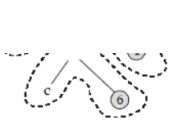
Q. 57 Have any Doubt ?

Consider the following SDT:
S → AS {printf(1)}
S → AB {printf(2)}
A → a {printf(3)}
B → bC {printf(4)}
B → dB {printf(5)}
C → c {printf(6)}
The output obtained when string "aadbc" is passed as input to the SDT is _____.

3364521 — Your answer is **Correct**3364521

Solution :

3364521
Therefore o/p : (3364521)



QUESTION ANALYTICS +

Q. 58 Have any Doubt ?

Suppose $R_1(\underline{A, B})$ and $R_2(\underline{C, D})$ are two relational schemas. Let r_1 and r_2 be the corresponding relational instances. (A, B) is a foreign key that refers to (C, D) in R_2. If data in r_1 and r_2 satisfies referential integrity, then which of the following is/are always true?

A $\pi_{A,B}(r_1) - \pi_{C,D}(r_2) = \phi$ — Your option is **Correct**

B $\pi_{C,D}(r_2) - \pi_{A,B}(r_1) = \phi$

C $\pi_{C}(r_2) - \pi_{A}(r_1) = \phi$

D $\pi_{B}(r_1) - \pi_{D}(r_2) = \phi$ — Your option is **Correct**

YOUR ANSWER - a,d | CORRECT ANSWER - a,d | STATUS - ✓

Solution :

(a, d)

Since (A, B) makes a foreign key reference to (C, D), $\pi_{A,B}(r_1) \subseteq \pi_{C,D}(r_2)$

$\Rightarrow \quad \pi_{A,B}(r_1) - \pi_{C,D}(r_2) = \phi$

Also it can be observed that

$$\pi_A(r_1) \subseteq \pi_C(r_2)$$
$$\pi_B(r_1) \subseteq \pi_D(r_2)$$

Therefore (a), (d) are correct.

QUESTION ANALYTICS +

Q. 59 Have any Doubt ?

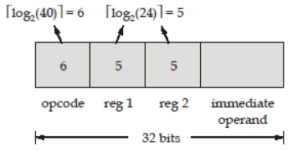
A processor has 40 distinct instructions and 24 general purpose registers. A 32-bit instruction word has an opcode, two registers operands and an immediate operand. The number of bits available for the immediate operand field is _____ (in bits).

16 — Your answer is **Correct**16

Solution :

16

Given data in the question:



$\therefore$ Number of immediate operand bits = 32 – (6 + 5 + 5) = 16 bits

QUESTION ANALYTICS +

Q. 60 Have any Doubt ?

We are given an array A in which every element is either 0 or 1. The time complexity of the most efficient algorithm which sorts A in descending order is equal to

A $O(n)$ — Your answer is **Correct**

Solution :

(a)

The simplest way is to scan the entire array once, and maintain a count of the number of 0's (zero_count) and 1's in the array (one_count) – for every 0 encountered, increment the zero_count and similarly do the same for the 1's also.

And then overwrite the array by first filling the array with 1's – the number of 1's being equal to one_count value, and do the same for 0's also. All this will take O(n) time and (a) is the answer.

B $O(n^2)$

C $O(n \log n)$

D $O(n (\log n)^2)$

QUESTION ANALYTICS +